

**IN THE CLAIMS**

Claims 1-26 (Canceled)

Claim 27 (New): An isolated nucleic acid molecule that encodes the amino acid sequence of a Drosophila Odorant Receptor protein or fragment thereof, wherein:

- (i) said Drosophila Odorant Receptor protein is expressed in one or both Drosophila olfactory organs selected from the group consisting of antenna and maxillary palp;
- (ii) said Drosophila Odorant Receptor protein contains seven transmembrane domains as defined by hydropathy analysis; and
- (iii) said nucleic acid molecule encodes a protein or fragment thereof which causes the firing of an olfactory neuron when stimulated.

Claim 28 (New): The isolated nucleic acid molecule of claim 27, wherein the encoded protein or protein fragment contains at least one conserved amino acid as compared to SEQ ID No. 31 by alignment using a BLAST algorithm, wherein said conserved amino acid is selected from the group consisting of:

- a) Leucine in the second extracellular domain at a position corresponding to position 120 of SEQ ID No. 31;
- b) Proline in the second intracellular domain at a position corresponding to position 175 of SEQ ID No. 31;
- c) Aspartate in the fourth transmembrane domain at a position corresponding to position

205 of SEQ ID No. 31;

d) Leucine in the third extracellular domain at a position corresponding to position 244 of SEQ ID No. 31;

e) Histidine in the third extracellular domain at a position corresponding to position 251 of SEQ ID No. 31;

f) Glutamine in the fifth transmembrane domain at a position corresponding to position 272 of SEQ ID No. 31;

g) Phenylalanine in the sixth transmembrane domain at a position corresponding to position 311 of SEQ ID No. 31;

h) Cysteine in the sixth transmembrane domain at a position corresponding to position 314 of SEQ ID No. 31;

i) Tryptophan in the fourth extracellular domain at a position corresponding to position 336 of SEQ ID No. 31;

j) Glutamine in the seventh transmembrane domain at a position corresponding to position 355 of SEQ ID No. 31;

k) Proline in the seventh transmembrane domain at a position corresponding to position 357 of SEQ ID No. 31;

l) Alanine in the seventh transmembrane domain at a position corresponding to position 362 of SEQ ID No. 31;

m) Glycine in the seventh transmembrane domain at a position corresponding to position

363 of SEQ ID No. 31;

- n) Alanine in the fourth intracellular domain at a position corresponding to position 380 of SEQ ID No. 31;
- o) Serine in the fourth intracellular domain at a position corresponding to position 382 of SEQ ID No. 31; and
- p) Threonine in the fourth intracellular domain at a position corresponding to position 385 of SEQ ID No. 31.

Claim 29 (New): The isolated nucleic acid molecule of claim 27, wherein the nucleic acid molecule is selected from the group consisting of SEQ ID Nos: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95 and 97.

Claim 30 (New): The isolated nucleic acid molecule of claim 27, wherein said amino acid sequence of a Drosophila Odorant Receptor protein is selected from the group consisting of SEQ ID Nos: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96 and 98.

Claim 31 (New): The isolated nucleic acid molecule of claim 27, wherein said nucleic acid molecule is operably linked to one or more expression control elements.

Claim 32 (New): An isolated host cell comprising the nucleic acid molecule of claim 27.

Claim 33 (New): The isolated host cell of claim 32, wherein the host cell is a prokaryotic host cell or a eukaryotic host cell.

Claim 34 (New): A vector comprising the isolated nucleic acid molecule of claim 27.

Claim 35 (New): An isolated host cell comprising the vector of claim 34.

Claim 36 (New): The isolated host cell of claim 35, wherein the host cell is a prokaryotic host cell or a eukaryotic host cell.

Claim 37 (New): A method for producing a protein or polypeptide comprising the step of culturing a host cell transformed with the nucleic acid molecule of claim 27 under conditions in which the protein or polypeptide encoded by the nucleic acid molecule is expressed.

Claim 38 (New): An isolated protein or polypeptide produced by the method of claim 37.

Claim 39 (New): An isolated protein or polypeptide encoded by the nucleic acid of claim 27.

Claim 40 (New): An isolated protein or polypeptide encoded by the nucleic acid of claim 30, wherein protein comprises an amino acid sequence selected from the group consisting of SEQ ID Nos: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94, 96 and 98.

Claim 41 (New): An isolated antibody that binds to the polypeptide of claim 39.

Claim 42 (New): The antibody of claim 41 wherein said antibody is a monoclonal or polyclonal antibody.

Claim 43 (New). A method of identifying an agent which modulates the expression of a protein or protein fragment of claim 39 comprising the steps of:

- a) exposing cells which express the protein or protein fragment to the agent; and
- b) determining whether the agent modulates expression of said protein or protein fragment, thereby identifying an agent which modulates the expression of a protein or protein fragment of claim 39.

Claim 44 (New): A method of identifying an agent which modulates at least one activity of a protein or protein fragment of claim 39 comprising the steps of:

a) exposing cells which express the protein or protein fragment to the agent; and  
b) determining whether the agent modulates at least one activity of said protein or protein fragment, thereby identifying an agent which modulates the activity of a protein or protein fragment of claim 39.

Claim 45 (New): A method of identifying an agent which modulates the transcription of the nucleic acid molecule of claim 27 comprising the steps of:

a) exposing cells which transcribe the nucleic acid to the agent; and  
b) determining whether the agent modulates transcription of said nucleic acid, thereby identifying an agent which modulates the transcription of the nucleic acid molecule of claim 27.

Claim 46 (New): A method of identifying binding partners for a protein or protein fragment of claim 39 comprising the steps of:

a) exposing said protein or protein fragment to a potential binding partner; and  
b) determining if the potential binding partner binds to said protein or protein fragment, thereby identifying binding partners for the protein or protein fragment.

Claim 47 (New): A method of modulating the expression of a nucleic acid encoding a protein or protein fragment of claim 39 comprising administering an effective amount of an agent which modulates the expression of a nucleic acid encoding the protein or protein fragment.

Claim 48 (New): A method of modulating at least one activity of a protein or protein fragment of claim 39 comprising the step of administering an effective amount of an agent which modulates at least one activity of the protein or protein fragment.

Claim 49 (New): A transgenic insect modified to contain the nucleic acid molecule of claim 27.

Claim 50 (New): The transgenic insect of claim 49, wherein the nucleic acid molecule contains a mutation that alters expression of the encoded protein.

Claim 51 (New): An isolated nucleic acid molecule that hybridizes to the nucleic acid of claim 29, under the following conditions: 7% SDS, 0.5 M sodium phosphate buffer at pH 7.2, 1 nM EDTA, pH 8.0 and 55°C, wherein the nucleic acid molecule encodes an amino acid sequence which causes the firing of an olfactory neuron when stimulated.

Claim 52 (New): An isolated nucleic acid molecule that hybridizes the nucleic acid of claim 29, under the following conditions: 7% SDS, 0.5 M sodium phosphate buffer at pH 7.2, 1 nM EDTA, pH 8.0 and 65°C, wherein the nucleic acid molecule encodes an amino acid sequence which causes the firing of an olfactory neuron when stimulated.

Claim 53 (New): An isolated nucleic acid molecule encoding a fragment of at least 25 consecutive amino acids of the protein of claim 40, wherein the fragment has odorant receptor activity, or is capable of generating an antibody which binds to the protein of claim 40.

Claim 54 (New): A method of identifying novel olfactory receptor genes comprising the steps of:

- a) selecting candidate olfactory receptor genes by screening a nucleic acid database using an algorithm trained to identify seven transmembrane receptors genes;
- b) screening said selected candidate olfactory receptor genes by identifying nucleic acid sequences with conserved amino acid residues and intron-exon boundaries common to olfactory receptors, and having open reading frames of sufficient size so as to encode a seven transmembrane receptor; and
- c) identifying the novel olfactory receptor genes and measuring the expression of olfactory receptor genes wherein the detection of expression confirms said candidate olfactory gene as an olfactory gene.

Claim 55 (New): A method of identifying novel olfactory receptor genes comprising the steps of:

- a) selecting candidate olfactory receptor genes by screening a nucleic acid database for nucleic acid sequences with sufficient homology to at least one known olfactory receptor gene;

b) screening said selected candidate olfactory receptor genes by identifying nucleic acids with conserved amino acid residues and intron-exon boundaries common to olfactory receptors, and having open reading frames of sufficient size so as to encode a seven transmembrane receptor; and

c) identifying the novel olfactory receptor genes and measuring the expression of olfactory receptor genes wherein the detection of expression in one or both of the antenna and/or maxillary palp confirms said candidate olfactory gene as an olfactory gene.